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Cross-flow shearing effects on the trajectory of highly buoyant bent-over plumes[1] ALI TOHIDI, University of Maryland College Park, NIGEL BERKELEY KAYE, Clemson University, MICHAEL J. GOLLNER, University of Maryland College Park — The dynamics of highly buoyant plumes in cross-flow is ubiquitous throughout both industrial and environmental phenomena. The rise of smoke from a chimney, wastewater discharge into river currents, and dispersion of wildfire plumes are only a few instances. There have been many previous studies investigating the behavior of jets and highly buoyant plumes in cross-flow. So far, however, very little attention has been paid to the role of shearing effects in the boundary layer on the plume trajectory, particularly on the rise height. Numerical simulations and dimensional analysis are conducted to characterize the near- and far-field behavior of a highly buoyant plume in a boundary layer cross-flow. The results show that shear in the cross-flow leads to large differences in the rise height of the plume in relation to a uniform cross-flow, especially at far-field.

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